Precision In-Space Manufacturing for Structurally-Connected Space Interferometry, Phase I

Completed Technology Project (2018 - 2019)

Project Introduction

Made In Space, Inc. (MIS) proposes the construction of large baseline structures, 15 meters or greater, for infrared space interferometry missions by autonomous in-space manufacturing and assembly. This enables the deployment of large primary trusses unconstrained by launch load or volume restrictions that meet science requirements for the high angular resolutions (less than 0.3 arcseconds) necessary to detect planets near bright stars and measure individual objects in star clusters. In this Phase I effort, MIS investigates the mass, performance, and mission planning benefits of in-space manufacturing for structurally-connected interferometers (SCI).

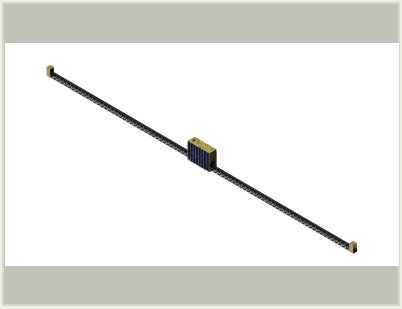
MIS is the leading developer of manufacturing technologies in the space environment. Utilizing technologies derived from Archinaut, a NASA Tipping Point 2015 award winner, large infrastructure can be manufactured on orbit and enable a multitude of missions. Optimast is a self-contained, scalable machine for producing microgravity-optimized linear structures on-orbit, developed as a product application of the Archinaut technologies. MIS has developed Optimast to a TRL-6 with successful thermal vacuum testing of extended structure manufacturing in 2017.

Adapting the MIS Optimast technology to produce long baseline structures with low thermal expansion materials enables simultaneous structural fabrication and positioning of the optical subsystems to the required absolute (static) and dynamic (thermal deflection and oscillation) tolerances. An Optimast-SCI baseline structure thus provides superior absolute position control over traditional deployable structures at much lower cost, mass, and integration complexity and eliminates the parasitic mass from hinge mechanisms and traverse rails.

Anticipated Benefits

Long baseline interferometry is necessary to provide the sub-arcsecond angular resolution and high spectral resolution for collecting spectral data on protostellar disks, finding protoplanets hidden in dust fields, and resolving questions about how galaxies merge. The Optimast-SCI technology is also applicable to the development of large deployable antennas, manufactured structures for large backplanes and other spacecraft systems, and structurally-connected interferometry in other wavelengths.

MIS has preliminarily identified opportunities for Earth remote sensing and space situational awareness for large optical interferometers in Earth orbit. Depending on the customer requirements for spatial resolution, target resolution, and imaging wavelength, MIS plans to consult with industry partners and further develop concepts for structurally-connected interferometers intended for commercial applications.



Precision In-Space Manufacturing for Structurally-Connected Space Interferometry, Phase I

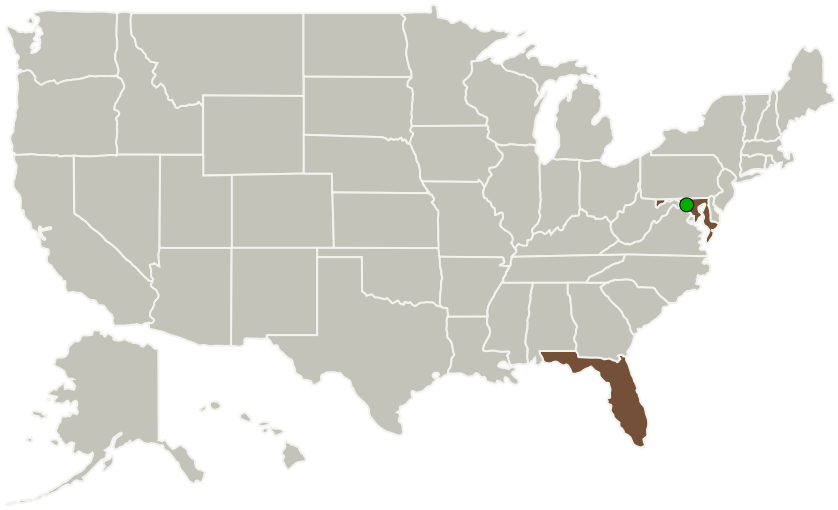
Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	2
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Technology Areas	3
Target Destinations	3

Precision In-Space Manufacturing for Structurally-Connected Space Interferometry, Phase I

Completed Technology Project (2018 - 2019)

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Made in Space, Inc.	Lead Organization	Industry	JACKSONVILLE, Florida
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Florida	Maryland

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141234)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Made in Space, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

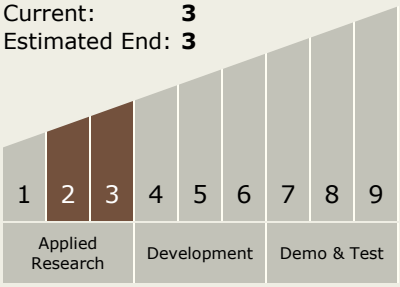
Carlos Torrez

Principal Investigator:

Michael Snyder

Technology Maturity (TRL)

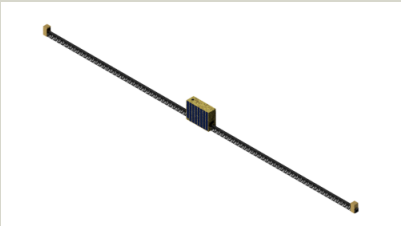
Start: **2**
Current: **3**
Estimated End: **3**



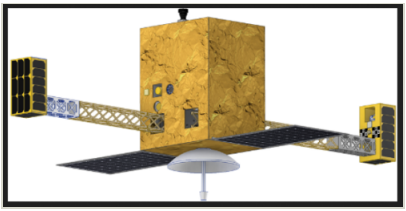
Precision In-Space Manufacturing for Structurally-Connected Space Interferometry, Phase I

Completed Technology Project (2018 - 2019)

Images



Briefing Chart Image
Precision In-Space Manufacturing for Structurally-Connected Space Interferometry, Phase I
(https://techport.nasa.gov/image/135701)



Final Summary Chart Image
Precision In-Space Manufacturing for Structurally-Connected Space Interferometry, Phase I
(https://techport.nasa.gov/image/136659)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components

Target Destinations

Earth, Outside the Solar System